9/966,424

	Type	L #	Hits	Search Text	DBs	Time Stamp
1	BRS	L1	121371	factory or factories or (paper near3 mill) or (pulp near3 mill)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/10/21 15:13
2	BRS	L2	217	(internet or web or www) near10 ((pulp near5 mill) or (paper near5 mill))	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/10/21 15:17
3	BRS	L3	206220	remote near10 (control$4 or monitor$4 or measur$4)	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/10/21 15:15
4	BRS	L4	3	l2 and l3	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/10/21 15:16

	Type	L #	Hits	Search Text	DBs	Time Stamp
5	BRS	L5	0	(internet or www) near10 ((pulp or paper or board) near10 (mill or plant))	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/10/21 15:19
6	BRS	L6	1	(internet or www) near20 ((pulp or paper or board) near10 (mill or plant))	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/10/21 15:21
7	BRS	L7	1	(internet or www or website or (web adj1 site)) near20 ((pulp or paper or board) near10 (mill or plant))	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/10/21 15:22
8	BRS	L8	10	(internet or www or website or (web adj1 site)) same ((pulp or paper or board) near10 (mill or plant))	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/10/21 15:28

	Type	L #	Hits	Search Text	DBs	Time Stamp
9	BRS	L9	2	6324490.pn.	USPAT; US-PGPUB; EPO; JPO; DERWENT; IBM_TDB	2003/10/21 15:28

```
?show files; ds
File  15:ABI/Inform(R) 1971-2003/Oct 21
         (c) 2003 ProQuest Info&Learning
File  16:Gale Group PROMT(R) 1990-2003/Oct 20
         (c) 2003 The Gale Group
File 148:Gale Group Trade & Industry DB 1976-2003/Oct 21
         (c)2003 The Gale Group
File 160:Gale Group PROMT(R) 1972-1989
         (c) 1999 The Gale Group
File 275:Gale Group Computer DB(TM) 1983-2003/Oct 20
         (c) 2003 The Gale Group
File 621:Gale Group New Prod.Annou.(R) 1985-2003/Oct 21
         (c) 2003 The Gale Group
File   9:Business & Industry(R) Jul/1994-2003/Oct 20
         (c) 2003 Resp. DB Svcs.
File  20:Dialog Global Reporter 1997-2003/Oct 21
         (c) 2003 The Dialog Corp.
File 476:Financial Times Fulltext 1982-2003/Oct 21
         (c) 2003 Financial Times Ltd
File 610:Business Wire 1999-2003/Oct 21
         (c) 2003 Business Wire.
File 613:PR Newswire 1999-2003/Oct 21
         (c) 2003 PR Newswire Association Inc
File 624:McGraw-Hill Publications 1985-2003/Oct 21
         (c) 2003 McGraw-Hill Co. Inc
File 634:San Jose Mercury  Jun 1985-2003/Oct 20
         (c) 2003 San Jose Mercury News
File 636:Gale Group Newsletter DB(TM) 1987-2003/Oct 20
         (c) 2003 The Gale Group
File 810:Business Wire 1986-1999/Feb 28
         (c) 1999 Business Wire
File 813:PR Newswire 1987-1999/Apr 30
         (c) 1999 PR Newswire Association Inc
File   2:INSPEC 1969-2003/Oct W2
         (c) 2003 Institution of Electrical Engineers
File  35:Dissertation Abs Online 1861-2003/Sep
         (c) 2003 ProQuest Info&Learning
File  65:Inside Conferences 1993-2003/Oct W3
         (c) 2003 BLDSC all rts. reserv.
File  99:Wilson Appl. Sci & Tech Abs 1983-2003/Sep
         (c) 2003 The HW Wilson Co.
File 233:Internet & Personal Comp. Abs. 1981-2003/Jul
         (c) 2003, EBSCO Pub.
File 256:SoftBase:Reviews,Companies&Prods. 82-2003/Sep
         (c)2003 Info.Sources Inc
File 474:New York Times Abs 1969-2003/Oct 20
         (c) 2003 The New York Times
File 475:Wall Street Journal Abs 1973-2003/Oct 20
         (c) 2003 The New York Times
File 583:Gale Group Globalbase(TM) 1986-2002/Dec 13
         (c) 2002 The Gale Group
File 240:PAPERCHEM 1967-2003/Oct W3
         (c) 2003 Elsevier Eng. Info. Inc.
File 315:ChemEng & Biotec Abs 1970-2003/Sep
         (c) 2003 DECHEMA
```

```
Set      Items   Description
S1        2961   (INTERNET OR WWW OR WEB) (S) ((PAPER OR PULP OR BOARD) (10-
             N) (MILL OR PLANT))
S2      256157   REMOTE (S) (INTERNET OR WEB OR WWW)
S3          16   S1 (S) S2
S4          12   RD (unique items)
S5           5   S4 NOT PY>2000
S6     1255771   REMOTE
S7          71   S1 AND S6
S8          50   RD (unique items)
S9         219   (INTERNET OR INTRANET OR WWW OR WEB) (S) ((PAPER OR PULP OR
                BOARD) (5W) (MILL AND PLANT))
S10     108218   DS
S11    2124438   (VIRTUAL OR REMOTE)
S12         19   S9 AND S11
S13         12   RD (unique items)
?save temp
Temp SearchSave "TD049" stored
?
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```
? s remote (s) (internet or web or www)
             2861  REMOTE
             1953  INTERNET
            28318  WEB
              276  WWW
      S2      157  REMOTE (S) (INTERNET OR WEB OR WWW)
?ds

Set     Items   Description
S1          1   (INTERNET AND WWW OR WEB-SITE OR WEBSITE) (S) ((PAPER OR P-
             ULP OR BOARD) (10N) (MILL OR PLANT))
S2        157   REMOTE (S) (INTERNET OR WEB OR WWW)
?s ((paper or pulp) (10n) (board or mill or plant)
```

5/9,K/5 (Item 2 from file: 2)
DIALOG(R)File 2:INSPEC

5717266 INSPEC Abstract Number: C9711-7810C-088
Title: Virtual lab: a Java application for distance learning
Author(s): Di Stefano, A.; Fazzino, F.; Lo Bello, L.; Mirabella, O.
Author Affiliation: Istituto di Inf. e Telecommun., Catania Univ., Italy
Conference Title: 1997 IEEE 6th International Conference on Emerging Technologies and Factory Automation Proceedings (Cat. No.97TH8314) p. 93-8
Publisher: IEEE, New York, NY, USA
Publication Date: 1997 Country of Publication: USA xxi+573 pp.
ISBN: 0 7803 4192 9 Material Identity Number: XX97-02370
U.S. Copyright Clearance Center Code: 0 7803 4192 9/97/$10.00
Conference Title: 1997 IEEE 6th International Conference on Emerging Technologies and Factory Automation Proceedings, EFTA '97
Conference Sponsor: IEEE Ind. Electron. Soc.; Soc. Instrum. & Control Eng. Japan; Mech. Syst. Panel ASME Dynamic Syst. & Control Div
Conference Date: 9-12 Sept. 1997 Conference Location: Los Angeles, CA, USA
Language: English Document Type: Conference Paper (PA)
Treatment: Practical (P)
Abstract: Recent progress in telecommunications has made it possible to develop software offering users new features such as access to **remote** resources from different geographical locations. At the University of Catania we have developed a Virtual Laboratory (VL) for distance learning. Our lab is realized in Java and uses the **Internet** or/and an Intranet to provide complete access to the lab's resources. Users can consult tutorials, run simulations and intervene in the production cycle of an educational industrial **plant** from any **Internet** node. This **paper** describes the general organization of the VL and the implementation choices made in order to guarantee the efficiency of resource management, provide adequate communication and security for the information exchange and ensure flexible, customized service configuration. (12 Refs)
Subfile: C
Descriptors: application program interfaces; computer aided instruction; graphical user interfaces; Internet; object-oriented languages; production engineering computing; resource allocation; virtual reality
Identifiers: Virtual Laboratory; Java; distance learning; University of Catania; Internet; Intranet; simulations; production cycle; resource management; information exchange; production engineering; graphical user interface; application programming interface
Class Codes: C7810C (Computer-aided instruction); C7480 (Production engineering computing); C6130B (Graphics techniques); C6180G (Graphical user interfaces); C6150J (Operating systems)

...Abstract: has made it possible to develop software offering users new features such as access to **remote** resources from different geographical locations. At the University of Catania we have developed a Virtual Laboratory (VL) for distance learning. Our lab is realized in Java and uses the **Internet** or/and an Intranet to provide complete access to the lab's resources. Users can consult tutorials, run simulations and intervene in the production cycle of an educational industrial **plant** from any **Internet** node. This **paper** describes the general organization of the VL and the implementation choices made in order to...
?

NPL

?t s1/9,k/1

1/9,K/1 (Item 1 from file: 240)
DIALOG(R)File 240:PAPERCHEM

00713788 PAPERCHEM NO: UNPUBLISHED
Strathcona website goes live
Anon
SOURCE: Offic Board Markets 76, no. 29: 1p (Jul 2000). [Engl.]
PUBLICATION YEAR: 2000
DOCUMENT TYPE: JOURNAL ARTICLE
LANGUAGES: ENGLISH

Toronto, Ontario based Strathcona Paper, has launched its **website** www.strathconapaper.com. The site offers product specification sheets, industry news, and regulatory news. Strathcona, is in final stages of implementing web-based technology companywide. This initiative will link, the **mill** 's new **paper** machine, stock preparation process control, and automation system with the company manufacturing execution and financial systems.

DESCRIPTORS: Automation; Commerce; Electronic commerce; Electronic media; ENGLISH; Inventory control; Paper mills; Paper products; Papermaking; Papermaking machinery; Process control; Strathcona paper (CO); Websites; World Wide Web

Toronto, Ontario based Strathcona Paper, has launched its **website** www.strathconapaper.com. The site offers product specification sheets, industry news, and regulatory news. Strathcona, is in final stages of implementing web-based technology companywide. This initiative will link, the **mill** 's new **paper** machine, stock preparation process control, and automation system with the company manufacturing execution and financial...
?

	Type	L #	Hits	Search Text	DBs	Time Stamp
1	BRS	L1	16812	remote near10 (maintenance or service)	USPAT; US-PGPUB	2003/10/21 13:59
2	BRS	L2	7531	(Internet or web or www) near10 ((production or paper or pulp)near5 plant) or (paper near2 mill) or (pulp near2 mill)	USPAT; US-PGPUB	2003/10/21 14:01
3	BRS	L3	21	l1 and l2	USPAT; US-PGPUB	2003/10/21 14:01

NFtext
1997

5/9,K/4 (Item 1 from file: 2)
DIALOG(R)File 2:INSPEC

5787085 INSPEC Abstract Number: C9802-7480-016
Title: Virtual Plant: a distributed environment for distance monitoring and control of industrial plants
Author(s): Di Stefano, A.; Bello, L.L.; Mirabella, O.
Author Affiliation: Ist. di Inf. e Telecommun., Catania Univ., Italy
Conference Title: INES'97. 1997 IEEE International Conference on Intelligent Engineering Systems. Proceedings (Cat. No.97TH8224) p.445-9
Editor(s): Rudas, I.J.
Publisher: IEEE, New York, NY, USA
Publication Date: 1997 Country of Publication: USA 591 pp.
ISBN: 0 7803 3627 5 Material Identity Number: XX97-02653
U.S. Copyright Clearance Center Code: 0 7803 3627 5/97/$5.00
Conference Title: Proceedings of IEEE International Conference on Intelligent Engineering Systems
Conference Sponsor: IEEE Ind. Electron. Soc.; IEEE Hungary Sect.; Banki Donat Polytech., Hungary; Nat. Committee for Technol. Dev., Hungary; IEEE Robotics & Autom. Soc
Conference Date: 15-17 Sept. 1997 Conference Location: Budapest, Hungary
Language: English Document Type: Conference Paper (PA)
Treatment: Practical (P)
Abstract: This **paper** proposes a Virtual **Plant** to access through the **Internet** (or Intranet) a **remote** industrial plant and interact with it from a distance. The aim is **remote** performance of the normal monitoring and control operations that are usually carried out locally, so that the technicians who evaluate the trend of the production cycle, or diagnose and possibly resolve any malfunctions that occur, do not necessarily have to be physically present in the plant itself but can operate from any part of the world through the **Internet** . This makes intervention not only timely but also efficient (it is possible to centralize logically correlated functions even when they refer to **remote** elements) and safe for the staff involved as they do not always have to be physically present in risky environments. (8 Refs)
Subfile: C
Descriptors: fault diagnosis; industrial plants; Internet; manufacturing data processing; object-oriented programming; telecontrol; virtual reality
Identifiers: Virtual Plant; distance monitoring; distance control; industrial plants; Internet; production cycle; fault diagnosis; remote industrial plant; object oriented programming
Class Codes: C7480 (Production engineering computing); C6130B (Graphics techniques); C5620W (Other computer networks); C6110J (Object-oriented programming)

Abstract: This **paper** proposes a Virtual **Plant** to access through the **Internet** (or Intranet) a **remote** industrial plant and interact with it from a distance. The aim is **remote** performance of the normal monitoring and control operations that are usually carried out locally, so...

... in the plant itself but can operate from any part of the world through the **Internet** . This makes intervention not only timely but also efficient (it is possible to centralize logically correlated functions even when they refer to **remote** elements) and safe for the staff involved as they do not always have to be...

3571 (Electronic computers)
NAICS CODES: 33421 (Telephone Apparatus Manufacturing); 32211 (Pulp Mills); 334111 (Electronic Computer Manufacturing)
SPECIAL FEATURES: LOB

... are growing in nearly every industry, and include everything from order entry to customer service, **remote** monitoring, maintenance and more. For pulp and paper mills, the main applications of Web-based...
...Kaunonen of Neles Controls says that e-business will have a major effect on the **paper mill** process control environment, particularly on the user interface. For example, the **Internet** will allow user interfaces to be based on popular **Web** browsers. The interface will be much easier to update via the **Web** . **Internet** tools will also be used heavily for documentation and training.
The Internet will further enable **remote** operations, which are already in operation, he says. "The superintendent can monitor processes from his...

...Voith Automation agrees that Internet technology will advance the development of interfaces--both local and **remote** --for process control systems. For example, he says that new GUI (graphical user interface) products...

...deliver its data to any client on the mill network, including other sites, via VPN (**virtual** private network) connections, says Wells. Advanced supervisory control will be done at the server side and some mills may opt to execute the supervisory control at a **remote** main server "farm."
"These supervisory packages would support all paper machines," says Wells. "A typical...
...software directly into their systems," says Biros.
With the rapid development of Internet applications, the " **virtual** " mill can't be far behind, according to Stephen E. Harr, process business marketing manager, worldwide pulp & paper industry for Rockwell Automation Inc. in Cleveland, Ohio.
"In the ' **virtual** ' mill, physical plant location is of less consideration in servicing the global marketplace," he says...is secure and allow the mill network to be connected to the Internet to allow **remote** maintenance by vendors and third party providers. The new electronic hardware will serve web pages...

...remotely, based on "data mining" agent programs running on the historical data stored on a **remote** server. The device could also support transmission of digital images via this link to the **remote** maintenance agent. "The local mill technician simply takes a digital image and inserts the camera...

13/9,K/6 (Item 3 from file: 16)
DIALOG(R)File 16:Gale Group PROMT(R)

06945805 Supplier Number: 58632567 (THIS IS THE FULLTEXT)
Fisher-Rosemount's ``Test Drive PlantWeb'' Web Site Wins Prestigious Internet Award; Site Receives ``WebAward'' from the Web Marketing Association Inc.
Business Wire, p0772
Jan 18, 2000
Language: English Record Type: Fulltext
Document Type: Newswire; Trade
Word Count: 496
TEXT:
Business Editors & High-Tech Writers
AUSTIN, Texas--(BUSINESS WIRE)--Jan. 18, 2000

Fisher-Rosemount recently received a "WebAward" for its Test Drive PlantWeb(R) Internet site (http://www.testdrivePlantWeb.com).

The award was granted by Web Marketing Association Inc., one of the most esteemed organizations on the Internet that recognizes superior corporate Web sites.

This marks the second major honor Fisher-Rosemount has received for its Test Drive PlantWeb Web site. In June, the site was lauded with the "Pro Award" by AwardNet, another organization that honors exemplary Web sites.

The WebAwards provide Internet professionals with recognition and validation for their outstanding work. The WebAwards are produced by the Web Marketing Association Inc. (WMA), an independent organization that evaluates and recognizes the standard of excellence for corporate Web sites. The Test Drive PlantWeb site was given the "Outstanding Web Site" distinction by the WMA.

"We're very pleased to be recognized with this prestigious award," said Jane Lansing, Vice President of Marketing. "The greatest delight has been our customer's heavy usage of the Test Drive PlantWeb site to easily configure their process plants and realize the dramatic savings from PlantWeb architecture."

Each WebAward entry is judged against a standard of excellence and then against other entries in a category. Entries were judged on a group of seven criteria, including design, innovation, content and ease of use.

WebAward winners are listed on the WebAwards Web site at http://www.webaward.org/main.shtml. Past winners have included Web sites for British Airways, Merrill Lynch, Texas Instruments and AT&T.

Fisher-Rosemount's Test Drive **Web** site puts users in the driver's seat of a **virtual** automation project, where they can see for themselves how much they can save by using the company's PlantWeb field-based architecture to set up a **virtual** chemical plant, refinery, or **pulp** and **paper mill** .

An easy-to-use, drag-and-drop interface activates a set of powerful, industry-specific models based on typical process configurations and automation strategies. Users can customize those models by adding or deleting process areas, units, or devices, or even adjusting such variables as labor rates and average wire run -- then immediately see the effect on control-room, drawing, wiring and commissioning costs.

Fisher-Rosemount (www.fisher-rosemount.com), a part of Emerson Electric Co., is a leading supplier of process management products and solutions, including control valves, regulators, transmitters, analyzers, process management systems, and related services. Its revolutionary PlantWeb field-based architecture (www.testdriveplantweb.com/go/p190) combines intelligent field devices, standards and scalable platforms, and modular software to provide not only process control, but also integrated asset management and integration with other plant and business systems.

St. Louis-based Emerson Electric Co. (NYSE:EMR) is a global manufacturer with market and technology leadership in five business segments: industrial automation; process control; heating, ventilating and air conditioning; electronics and telecommunications; and appliance and tools. Sales in fiscal 1999 were $14.3 billion.

PlantWeb is a mark of one of the Fisher-Rosemount family of companies.

PUBLISHER NAME: Business Wire
COMPANY NAMES: *Fisher-Rosemount Systems Inc.
GEOGRAPHIC NAMES: *1USA (United States)
PRODUCT NAMES: *3823000 (Process Instruments, Controls)
INDUSTRY NAMES: BUS (Business, General); BUSN (Any type of business)
SIC CODES: 3823 (Process control instruments)
NAICS CODES: 334513 (Instruments and Related Products Manufacturing for Measuring, Displaying, and Controlling Industrial Process Variables)
SPECIAL FEATURES: LOB; COMPANY

communications are appearing everywhere.

For example, one project at a P&G **paper mill** transferred maintenance records for the plant's tissue-making machine from a supervisor's white board to a **Web** -based log. Technicians can now review real-time maintenance histories directly from the factory floor, and the updates they enter are immediately available to plant engineers a continent away.

P&G expects that improved access to internal information and applications will help sharpen market focus, shorten product development cycles and improve sales through faster inquiry response.

Poised for the Future

Airbus, DaimlerChrysler, Procter & Gamble...these are just three of the companies building their futures on Intel's technology and vision for collaboration in the enterprise. As a large manufacturer in its own right, Intel experiences firsthand the challenges companies face as they compete in an increasingly real-time world.

Intel's state-of-the-art computing architectures now power innovation in manufacturing all around the world. They make it possible for companies across industries to design and produce products faster and better, manage more nimble, efficient manufacturing operations, communicate in real-time across multiple enterprises, and serve customers far more responsively than previously possible. Intel's commitment to a volume economics model--driving performance while reducing cost--makes it a true technology leader for manufacturers worldwide.

PUBLISHER NAME: Penton Media, Inc.
COMPANY NAMES: *Intel Corp._Management
DESCRIPTORS: *Semiconductor industry--Management; Business-to-business market--Information services
EVENT NAMES: *220 (Strategy & planning)
GEOGRAPHIC NAMES: *1USA (United States)
PRODUCT NAMES: *3674000 (Semiconductor Devices)
INDUSTRY NAMES: BUS (Business, General); BUSN (Any type of business)
SIC CODES: 3674 (Semiconductors and related devices)
NAICS CODES: 334413 (Semiconductor and Related Device Manufacturing)
TICKER SYMBOLS: INTC

... manufacturer launched an Internet portal that assists suppliers in three important areas: procurement, forecasting and **remote** connectivity.

In the purchasing arena, the portal offers four related tools for suppliers:

* Intel Web...of time, cost and uncertainty out of the design chain," notes Gibbs. "With E-vis, **virtual** design teams can make design changes almost instantaneously, and all parties can make decisions based... applications for intranet communications are appearing everywhere.

For example, one project at a P&G **paper mill** transferred maintenance records for the plant's tissue-making machine from a supervisor's white board to a **Web** -based log. Technicians can now review real-time maintenance histories directly from the factory floor...

13/9,K/5 (Item 2 from file: 16)
DIALOG(R)File 16:Gale Group PROMT(R)

07310779 Supplier Number: 61638780 (THIS IS THE FULLTEXT)
The issue is information.(Statistical Data Included)
ROOKS, ALAN

(V)

PIMA's North American Papermaker, v82, n3, p32
March, 2000
ISSN: 1046-4352
Language: English Record Type: Fulltext
Article Type: Statistical Data Included
Document Type: Magazine/Journal; Trade
Word Count: 3648
TEXT:

Industry buzzwords may change, but one key process control trend remains clear: more integration with information systems throughout the mill and enterprise. In addition, mills are employing new Internet-based systems to manage process control, moving toward new models of system maintenance, and evaluating the merits of embedded control systems. Papermaker's expert panel sorts out the issues.

If process control is a mill's brain and nervous system, sensing and correcting for small variations in key processes, then its information technology (IT) is the circulatory system, carrying vital data to all parts of the enterprise. Together, the systems help gigantic mills "see," "hear" and respond to changing conditions. Helping these two vital systems to work together and improve mill productivity has long been a goal of mill management.

Today, computing environments in the pulp and paper industry have progressed to the point that some process control networks are now routinely feeding data into pulp and paper mill information systems. Some mills' process control and information technology (IT) networks are so closely linked that the two departments are being merged into one. With the long predicted "millwide information system" fast becoming a reality, paths for future development of process control are becoming clearer.

"For many years now the lines between process control and IT have blurred," says Dave Biros, AccuRay systems marketing manager for ABB's pulp & paper division in Columbus, Ohio. "Scanning quality control systems used to be the exclusive realm of process control departments, working on behalf of production. But more and more of these decisions are now shared with IT. The advent of PC-based controls gave a vote to IT, whose job was to manage PCs. And it was IT that largely pushed Microsoft Windows NT as a development platform for mill-floor controls. Just a few years ago, it would be unheard of to control multi-million dollar machines with PCs and Microsoft software. But that's exactly what's happening today."

As a result, says Biros, automation suppliers are developing systems to accomplish both "old-fashioned" paper machine control, while making it easier to get plant-floor information into high-level business systems. "Demand for Microsoft compatibility has been so dominant that an organization known as the OPC Foundation now exists to promote adherence to Microsoft standards among process control suppliers," he says. "OPC stands for 'OLE for Process Control,' with OLE standing for 'Object Linking and Embedding,' referring to communications between two Microsoft applications. As a result, many automation suppliers now have OPC products."

IT and process control integration has been aided immeasurably by dramatic increases in processing power and memory, communications, and standard connections for multiple systems. "These open systems easily enable the connection of separate systems," says Antti Kaunonen, professor at the Tampere University of Technology and senior vice president, strategy and marketing for Neles Automation, Helsinki, Finland. "Soon, the differences among automation systems in the mill will be like lines drawn into water. The user is less interested and aware of where the analysis and number crunching are being performed, as long as information is easy to access."

Kaunonen states that the real challenge for operators is navigating the ocean of available information. "Traditionally, automation has been justified by cutting down on the number of employees. However, an attitude change has been finally sweeping through the industry: automation systems are now being valued for their ability to help the human operator work more efficiently. The information explosion has revolutionized the morning meetings in many mills. Now everyone can come to that meeting armed with

spreadsheets and trends showing the last day's operations."

However, Kaunonen notes that operators as well as engineers must have access to a shared pool of knowledge to learn about the processes and best practices. "To address this need for continuous improvement, the open network incorporates a 'knowledge database' using an Internet-like browser function," he says. "The knowledge database is an organized, continuous operator journal. In addition to operating experiences, complete operating and procedures manuals, CAD drawings and supplier technical manuals can be made accessible to the operators and mill technical staffs. Mill improvement teams can also use this process knowledge in conjunction with other information tools to improve process design."

Process automation will store and feed this information to enterprise applications. "The challenge is to ensure that data is valid," says Kaunonen. "Otherwise, enterprise applications will not be able to do their part. Data validation becomes a major challenge."

Hannu Nieminen, research director for Honeywell-Measurex in Varkaus, Finland, agrees that increased visibility of key mill operations will be a key feature of more integrated systems: "With online visibility of production, quality and performance, process operators will be more conscious of how process execution contributes to mill optimization. Operators will be more empowered to contribute to the mill's business results."

Nieminen says that millwide information systems will complement information exchange between control subsystems, such as those for process control, quality control, web imaging and web monitoring. "Longer time frames, wider reference ranges and more refined data selection can be provided for process operators. This can help maintain awareness of the 'big picture."'

In addition to operator empowerment, online availability of millwide information will provide new process control opportunities. For example, Nieminen notes that applications of control methodologies making use of experiential data, such as neural net and statistical process control technologies, have been somewhat constrained due to the special arrangements needed to get long term good history data for training or adapting the strategies. Better and continuous availability of mill operating information will boost the use of intelligent control applications by providing them with the long-term reference they need to optimize performance.

"To be realistic, realizing control benefits from millwide information systems will probably be very gradual," he says. "The big challenge will be information analysis and validation to represent exactly what it was intended to. A taste of the challenge has already been experienced with the complex data mining needed to make use of the gigabytes of data collected in various information and history collection systems."

The move to millwide network applications will have many benefits for pulp and paper applications, among them lower system maintenance costs and simpler upgrades, according to Dr. Charles Wells, vice president of engineering, Voith Sulzer Automation, Los Gatos, Calif.

"We see a rapid migration to client/server network computing in millwide network applications," he says. "These applications will run on 'thin-client' computers, some of which will be handheld mobile devices. The server-side applications can be maintained without requiring client-side software to be upgraded, providing great savings in software maintenance costs and allowing the applications to be effortlessly upgraded."

Wells states that server-side applications will grow rapidly, including the introduction of more sophisticated products and quality assessment packages. He projects that a wide variety of "data mining" applications running on the server will provide the means to detect process problems before they significantly affect product quality. Large data storage systems will allow papermakers to retain complete data histories of the manufacturing process, providing the data needed to maintain product quality, early detection of process problems, as well as sales and technical support tools to help customers convert the paper into end user

products.

A NET GAIN

Internet-based systems applications are growing in nearly every industry, and include everything from order entry to customer service, **remote** monitoring, maintenance and more. For pulp and paper mills, the main applications of Web-based systems for process control appear to be in improving communications, upgrading system software and networking.

Kaunonen of Neles Controls says that e-business will have a major effect on the **paper mill** process control environment, particularly on the user interface. For example, the **Internet** will allow user interfaces to be based on popular **Web** browsers. The interface will be much easier to update via the **Web** . **Internet** tools will also be used heavily for documentation and training.

The Internet will further enable **remote** operations, which are already in operation, he says. "The superintendent can monitor processes from his office or even from the airport using his PC or portable phone. In addition, he can send messages to control rooms for night shifts. This has had a positive impact on communications and situation awareness in the production organization."

The Internet can also be used to foster cooperation among system users, vendors and third parties. "Current product lists and brochures on web sites are a beginning of supplying product information, and gradually the products themselves, on the web," says Kaunonen. "Some products will be found suitable for e-commerce on the web, such as I/O units and control packages for sharply isolated process problems, and tuning services on installed controls."

Wells of Voith Automation agrees that Internet technology will advance the development of interfaces--both local and **remote** --for process control systems. For example, he says that new GUI (graphical user interface) products will use an Internet browser as the software of choice for the user interface: "The user interface will simply be an XML (extensible markup language) page running on a server in the mill. HTTP and ASP (active server page) technology will be used initially for the implementation; however, in a few years, XML will take over. The user pages will use ActiveX, VBScript and JavaScript to provide animation and data retrieval functions, and the user commands from the browser interface will be dispatched via OPC client! servers. The OPC servers will be part of all new computerized equipment being installed in the mill."

As a result, any new device linked to the process will deliver its data to any client on the mill network, including other sites, via VPN (**virtual** private network) connections, says Wells. Advanced supervisory control will be done at the server side and some mills may opt to execute the supervisory control at a **remote** main server "farm."

"These supervisory packages would support all paper machines," says Wells. "A typical example might be multivariable color control. The supervisory controller runs on the server farm and sends changes to the dye flow rates to the mill PLC/DCS that controls the single loops. The color controllers of the future will use the full spectrum as its input, computing outputs to many flow loops."

Internet technology has "crossed over" to many process control applications, according to Biros of ABB. For example, some operator stations use Microsoft Internet Explorer to "publish" operator displays, such as reel reports, for anyone on a mill's network just by typing the address into Internet Explorer. This information can also be retrieved from outside the mill using the same approach.

Biros notes other advances using Internet technology, such as Web-based control tuning and maintenance tools, useful for paper companies that want tuning and maintenance resources, but not at every site. He also says that ordering parts over the Internet is easy, efficient and cost-effective for suppliers and customers alike.

"Finally, the Internet has given us a much easier way to sell and distribute new software: customers just type in their account number and we download software directly into their systems," says Biros.

With the rapid development of Internet applications, the " **virtual** "

mill can't be far behind, according to Stephen E. Harr, process business marketing manager, worldwide pulp & paper industry for Rockwell Automation Inc. in Cleveland, Ohio.

"In the ' **virtual** ' mill, physical plant location is of less consideration in servicing the global marketplace," he says. "Customer orders are assigned to manufacturing resources based on a particular mill's ability to meet required delivery times, customer quality requirements, and so on. The effect on individual mills within an organization is to set up an internal competition for order assignment."

In this scenario, process control decisions become focused upon optimizing a mill's manufacturing agility, says Harr. "As a result, MES applications take a lead role, concentrating on items such as production scheduling, roll/set analysis and trim optimization, as well as the documentation, tracking and historization of roll quality. For paper machine operations, integration of wet end controls with the paper machine quality system is key to optimizing grade changes."

MAJOR MAINTENANCE MOVES

Many installed process control systems are aging, and as a result system maintenance is becoming a more important issue for pulp and paper mills. While traditional maintenance (spare parts and tune-ups) is still important, more process control maintenance activity will move into the area of productive systems upgrades.

For the most part, our panel agrees that users have been able to live with their aging systems based on available spare parts and maintenance services. However, the oldest generations of digital automation systems are reaching the age where full spare service will become a challenge, says Nieminen of Honeywell-Measurex. "This will move some of the emphasis from traditional corrective maintenance to system upgrades to use new available technology in key areas," he says. "Responsible suppliers will offer various levels of graceful upgrades to the systems, reusing the maintainable parts of aging installations as part of new system architectures. To avoid similar situations in the future, suppliers have developed continuous upgrade programs for installed systems, keeping them up to date at predictable cost."

Kaunonen of Neles Automation notes that the role of the traditional service technician is changing. He says that "hard" skills used to fix complicated electro-mechanical equipment are less in demand, while "soft" skills used for troubleshooting the process, finding cause/effect relationships, and reporting results are more in demand.

"Papermaking combines process, machine, automation and human organization in one entity," says Kaunonen. "The success of a paper company depends how efficiently it is able to combine these factors. Recent changes minimizing organizational levels in pulp and paper mills have changed the content of the work. In the future, the responsibilities of operators and service technicians will increase and their level of education will be higher than today. In the new cross-functional team approach, which many mills are adopting, the old distinctions between service and operations functions are fading away. At modern mills, most routine maintenance tasks are the responsibility of the operating crew."

Kaunonen observes that many pulp and paper companies have outsourced service functions, and that suppliers have responded by adding to their service offerings. "The challenge for suppliers is to be able to have extended services focusing not only on their own products but the whole process. The total care concept means that several suppliers will no longer provide their own separate services, but that a main supplier will be selected to assume total service responsibility."

The Internet is playing a major role in restructuring the service function. "Cyber support will make it possible for the specialists from different organizations and locations to troubleshoot and optimize the system simultaneously," says Kaunonen. "Resident babysitting services will be no longer even considered."

Harr of Rockwell Automation agrees that the concept of a single control system vendor or third party maintenance company servicing all control systems at a mill is gaining acceptance. "Not so long ago it was,

and in many instances still is, commonplace to see contract service personnel from multiple gauging system, DCS and drives systems vendors in the same mill simultaneously, if not physically resident at the mill," he says. "Personnel cross-pollination in the maintenance services industry now allows vendors to capitalize upon this acquired expertise by servicing both their own systems and third party systems."

The desire to improve performance has clearly led the development of new maintenance models in process control. For example, ABB offers "performance-based pricing." Under this agreement, if mutually agreed-upon performance levels are achieved, ABB gets its asking price. If these levels are not achieved, it receives a smaller sum. And, if higher levels are achieved, it receives more than its asking price. "This scenario will not work for all applications," says Biros. "However, this creative thinking will continue to dominate in this era of high-value service expectations."

According to Biros, mills should also consider using an "evergreen" approach to new technology development with their process automation suppliers, where all new developments are compatible with the mill's installed base. Under this approach, most products are supported through price incentives, "Step Up" programs and software exchange policies.

Wells ofVoith Automation says that mills should take into account new maintenance "paradigms" when they are upgrading older process control systems. "New hardware should support OPC with built-in 100 MHz TCP/IP connectivity," he says. "Mill management will gradually accept that the Internet is secure and allow the mill network to be connected to the Internet to allow **remote** maintenance by vendors and third party providers. The new electronic hardware will serve web pages to clients visiting the site from the Internet. The web page, for example, would report on the health of the device and provide means for external diagnostics, software upgrades, and e-mail notification of status of the device."

Wells says that, for example, a device measuring basis weight could be recalibrated remotely, based on "data mining" agent programs running on the historical data stored on a **remote** server. The device could also support transmission of digital images via this link to the **remote** maintenance agent. "The local mill technician simply takes a digital image and inserts the camera 'memory stick' in the device," says Wells. "This triggers a transmission of the image to the maintenance provider. These images could easily be 'MP3' motion and sound images and could be transmitted in real time to the maintenance provider."

ARE EMBEDDED SYSTEMS SETTLING IN?

Recent mergers and acquisitions among process automation vendors and paper machine suppliers have speeded the development of embedded sensors and control systems in paper machinery. Perspectives on this issue, as one might expect, vary widely.

"Modern paper machine technology can be compared to that of a high performance racecar," says Kaunonen of Neles Automation. "When designing a racecar, right from the start the development team carefully combines the best technologies available from different engineering. In a high performance racecar, computers with the test drivers' know-how are embedded in the car design. Embedding process automation in paper machine design is a similar process. For example, Neles Automation and Valmet have brought together paper machinery, process and automation know-how to design and to implement the Valmet OptiConcept paper machine."

Kaunonen says that embedded automation solutions narrow the interface between process and instrumentation and raise the automation level of process equipment deliveries. For example, embedded process measurements and controls can integrate stock preparation, wet end and dry end controls. "The strategy is to use integrated controls to stabilize variations early in the process. It is too late to make corrections on the actual paper machine."

According to ABB's Biros, the key issue in any control system--embedded or otherwise--is how the system is supported.

"There is value for a process control supplier to be owned by a paper machine maker, since the financial support of the paper machine maker helps

the process control company survive," he says. "The required investment to stay competitive is tremendous. The most significant process control developments in the future will come from companies whose primary business is process control. Paper machinery ownership of process control companies has never resulted in innovative process control. Such ownership positions are held to sell paper machines."

Biros says that "embedded sensors" have marketing value, but that profit pressures in what is essentially a low-margin business may force paper machine makers to sell what they can from existing portfolios, and true value-added investment may be a challenge. "The force of high-ticket 'big iron' will always squeeze investment for low-ticket 'softer' computer-based process control," he says.

Nieminen of Honeywell-Measurex says that, when considering embedded control, a supplier's breadth of experience in automation solutions should be considered along with its "vertical," industry-specific applications. "Most system requirements are general and ideas are applicable across industries," he says. "Broad scale operation in the automation business gives the supplier the required momentum to lead the evolution in all served industries, with a best available guarantee that the solutions will represent the lasting mainstream, and not vertical, market specific shortcuts that could show to be dead ends in the long run."

However, he says, the picture is not completely black and white. "Large general automation suppliers have parts of their organizations dedicated to the served industries as accumulation points for business and process understanding. They provide specific technologies and add value to the generic systems and applications. They can also provide embedded solutions to process vendors' equipment, without losing sight of the overall market or their independence."

Wells of Voith Automation notes that "smart machines" have been discussed for many years and are finally beginning to be used in paper mills. "The question tomorrow will not be whether the machine is smart but what is the IQ of the machine," he says. "Smart machinery and processes with embedded sensors and controls allow for better modeling, for faster, smoother machine transitions such as start-ups and grade changes, tighter control during continuous operation, and faster diagnostics of potential machine problems before product quality or process operation is negatively affected." Wells says that although the future development of smarter machines and processes will benefit new machines or major rebuilds the most, many of the developments will be applicable on existing machines as well.

While embedded systems are being developed, the implementation of open systems standards will tend to "level the playing field" for automation suppliers whether or not they are affiliated or merged with a paper machinery manufacturer, according to Han of Rockwell Automation. "We are already seeing traditional suppliers of control system hardware shifting their focus to applications software because of the 'off-the-shelf' nature of today's open system hardware platforms," he says. "The concept of building a control system from a number of 'best-in-class' point solutions is being realized today. Papermakers will not allow embedded control systems to be forced upon them if it means accepting a 'less-than-best' control solution."

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SPECIAL FEATURES: LOB

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